NEW YORK GATEWAY
CONNECTIONS IMPROVEMENT PROJECT
TO THE US PEACE BRIDGE PLAZA

Draft Design Report/Environmental Impact Statement

Draft Section 4(f) Evaluation (49 USC 303)

APPENDIX C – AIR QUALITY

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City of Buffalo
Erie County, New York

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U.S. Department of Transportation
Federal Highway Administration

New York State
Department of Transportation

Appendix C

Air Quality

November 2013

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List of Abbreviations and Acronyms

CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
DEIS	Draft Environmental Impact Statement
E & E	Ecology and Environment, Inc.
EPA	(United States) Environmental Protection Agency
EPC	Environmental Performance Commitments
ETC	Estimated Time of Completion
FHWA	Federal Highway Administration
GHG	greenhouse gas
I-190	New York State Thruway, Interstate 190
LOS	level of service
MOVES	EPA's MOVES2010b model
MSAT	Mobile Source Air Toxics
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NO_2	nitrogen dioxide
N_2O	nitrous oxide
NURP	Nationwide Urban Runoff Program
NYCRR	New York Codes, Rules, and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSDOT	New York State Department of Transportation
PAHs	polycyclic aromatic hydrocarbons
PM_{10}	particulate matter with aerodynamic diameters less than or equal to 10 microns

List of Abbreviations and Acronyms (cont.)

$PM_{2.5}$	particulate matter with aerodynamic diameters less than or equal to 2.5 microns
POM	polycyclic organic matter
ppm	parts per million
SEQRA	State Environmental Quality Review Act
SO_2	sulfur dioxide
TEM	NYSDOT's *The Environmental Manual*
VOC	volatile organic compounds
VMT	vehicle miles traveled

1 Introduction

The Federal Highway Administration (FHWA), in cooperation with the New York State Department of Transportation (NYSDOT), has prepared this Draft Environmental Impact Statement (DEIS) in accordance with the National Environmental Policy Act (NEPA) for the New York Gateway Connections Improvement Project to the U.S. Peace Bridge Plaza (Project). The Project is located in the city of Buffalo, Erie County, New York. The Project was developed to address concerns centered on the use of local streets by cross-border traffic as it enters/exits the existing U.S. Border Port of Entry/Peace Bridge Plaza (Plaza). For this Project, the FHWA and NYSDOT are the NEPA joint lead agencies, and NYSDOT is the SEQRA lead agency.

The DEIS was prepared in accordance with the NYSDOT Project Development Manual, 17 NYCRR (New York Codes, Rules and Regulations) Part 15, and 23 CFR (Code of Federal Regulations) 771. The need, purpose, and objectives of the Project and the alternatives being considered are briefly described below. More detailed discussions concerning the Project, the environmental considerations, and options considered are provided in Chapters 1, 2, 3, 4, and 6 of the DEIS.

The air quality analysis was conducted to assess the air quality impacts of the No Build and Build Alternatives as required by NEPA and SEQRA. The analyses address particulate matter and mesoscale emissions from the Study Area and include a microscale impact analysis for particulate matter and a Mobile Source Air Toxics (MSAT) assessment. The air quality analyses were performed in accordance with methodologies presented in NYSDOT's *The Environmental Manual* (NYSDOT 2001, as updated in 2012); FHWA's MSAT guidance (FHWA 2012); and the U.S. Environmental Protection Agency's (EPA's) guidance for assessing carbon monoxide (CO) and particulate matter (PM) hot-spots using the MOVES2010b (MOVES) model (EPA 2010a, 2010b).

The Build Alternative results in lower mesoscale, MSAT, and greenhouse gas emissions and lower energy consumption in comparison to the No Build Alternative. The microscale analysis for PM2.5 and PM10 shows the Build Alternative results in lower ambient concentrations in comparison to the No Build Alternative.

1.1 Where is the Project Located?

The Project is located in the West Side neighborhood of the city of Buffalo, Erie County, New York. The Study Area is adjacent to Front Park, which was designed by Frederick Law Olmsted as part of a citywide park and parkway system that opened in 1868; the Project also includes a small portion of the park (the existing Baird Drive). Major roadways in the Study Area include the Niagara Thruway (Interstate 190, or I-190), Porter Avenue, Baird Drive, Busti Avenue, and the I-190 ramp connections to and from the Plaza.

1.2 Need, Purpose, and Objectives

The primary need for the Project is to address the limited direct access between the Plaza and I-190. Existing direct access is limited and requires regional and international traffic to use the local street system. This limited direct access increases commercial traffic on the local streets, which were originally designed to meet only the needs of local traffic. An additional need was identified to address the structurally deficient Porter Avenue bridge over I-190.

The purpose of this Project is to reduce the use of local streets by international traffic (autos and trucks) that utilizes the existing Plaza at its current location. The following objectives have been established to support the Project's purpose and need.

- Provide direct access from the Plaza to northbound I-190,
- Redirect through traffic from Front Park,
- Remove Baird Drive, and
- Replace the Porter Avenue Bridge over I-190.

1.3 What Alternative (s) Are Being Considered?

Based on the Project's need, purpose, and objectives, the following paragraphs briefly describe the alternatives that have been developed for study within this DEIS.

- **No-Build Alternative.** The No-Build Alternative assumes no improvements in the Study Area other than those planned by others or implemented as part of routine maintenance. Although the No-Build Alternative does not meet the Project's purpose and need, NEPA requires that it be evaluated in the EIS. The No-Build Alternative also serves as the baseline condition against which the potential benefits and effects of the Build Alternative are evaluated.
- **Build Alternative.** The Build Alternative would construct a new ramp (Ramp D) to provide direct access from the Plaza to northbound I-190. It would also construct a new ramp (Ramp PN) from Porter Avenue to the existing I-190 northbound exit-ramp (Ramp N/Ramp A) to the Plaza. The combination of these new ramps would allow the removal of Baird Drive from Front Park and conversion of the existing 1.8 acres of roadbed and sidewalk into additional

green space. The removal of Baird Drive would permit 4.5 acres of green space located between Busti Avenue and Baird Drive to be reconnected to the greater park area. This alternative would require modifications to the Massachusetts Pumping Station access road, the Shoreline Trail bicycle/pedestrian facility along the waterfront, and four existing exit/entry ramps in the vicinity of the Plaza, as well as new signage in the vicinity of and within the Plaza to better direct vehicles to the appropriate ramps and routes.

Porter Avenue would be modified to include a roundabout or signalized intersection at 4th Street and the existing Ramp P and the proposed Ramp PN. Modifications along Porter Avenue would also include removal and replacement of the bridge over I-190 to optimize the traffic flow to the Plaza from I-190 northbound and allow for the construction of a new shared-use path along Porter Avenue to connect Front Park to LaSalle Park and the Niagara River waterfront.

The Shoreline Trail (Riverwalk) crossing over the CSX railroad would be relocated along a new alignment north of its existing location to accommodate construction of the new Ramp D. A new structure would be constructed over I-190 and the CSX railroad, and the realigned Shoreline Trail would then turn south along the Black Rock Canal. The new trail segment would extend directly along the waterfront before connecting to the existing Shoreline Trail south of its existing underpass beneath I-190.

2 Air Quality Analysis Methodology

The air quality study area (Study Area) encompasses the area shown in Figure C-1. All local streets, urban arterials, and interstate highways within the Study Area were included in this analysis. The analysis methodology consisted of the following:

- Define and obtain the traffic data required as input for the project-level analysis, including level of service (LOS), traffic volume and signal timing data, and analysis year for study;
- Determine emission factors for cars and trucks on roads in the Study Area for the No Build and Build Alternatives for three future analysis years, defined as the estimated time of completion (ETC), ETC+10 years, and ETC+20 years.
- From emission factors and miles travelled by vehicle types in the Study Area, determine the mesoscale emissions of criteria pollutants and greenhouse gases (GHGs) and total energy consumption for each analysis year;
- Determine the worst-case emission year based on highest emissions;
- Evaluate potential for microscale impacts by evaluating LOS data (CO only);
- Conduct a CO microscale analysis for the Study Area if one or more intersections has a LOS D, E, or F;
- Conduct a particulate matter (PM_{10} and $PM_{2.5}$) microscale analysis; and
- Conduct a MSAT analysis.

The air quality analyses were performed in accordance with methodologies presented in the NYSDOT's *The Environmental Manual* (TEM), updated in December 2012 (NYSDOT 2001). The NYSDOT TEM guidance specifies use of the MOVES emission factor model, and specifies the EPA guidance "Using MOVES in Project-Level Carbon Monoxide Analyses" (EPA 2010a) and "Transportation Conformity Guidance for Quantitative Hot-Spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas" (EPA 2010b) for project-level microscale/hot-spot analyses for NEPA and SEQRA. In addition to the TEM guidance, the FHWA's "Interim Guidance Update on MSAT Analysis in NEPA Documents" (FHWA 2012) was used.

The air analysis compares the Build Alternative with the No Build Alternative. The Build Alternative consists of two options that are similar except for the configuration of the intersection of Porter Avenue/4th Avenue and the entrance to I-190 northbound. In the first option, Build Alternative with Signalized intersection (Option A), the intersection is configured as a standard, signalized intersection with conventional through and turn lane configurations. In the second option, Build Alternative with Roundabout Option (Option B), the intersection is configured as a roundabout with no signalized traffic control, essentially allowing traffic to freely flow through the intersection with minimal to no delay; traffic approaching the roundabout may be required to slow or stop based on the traffic volume within the roundabout.

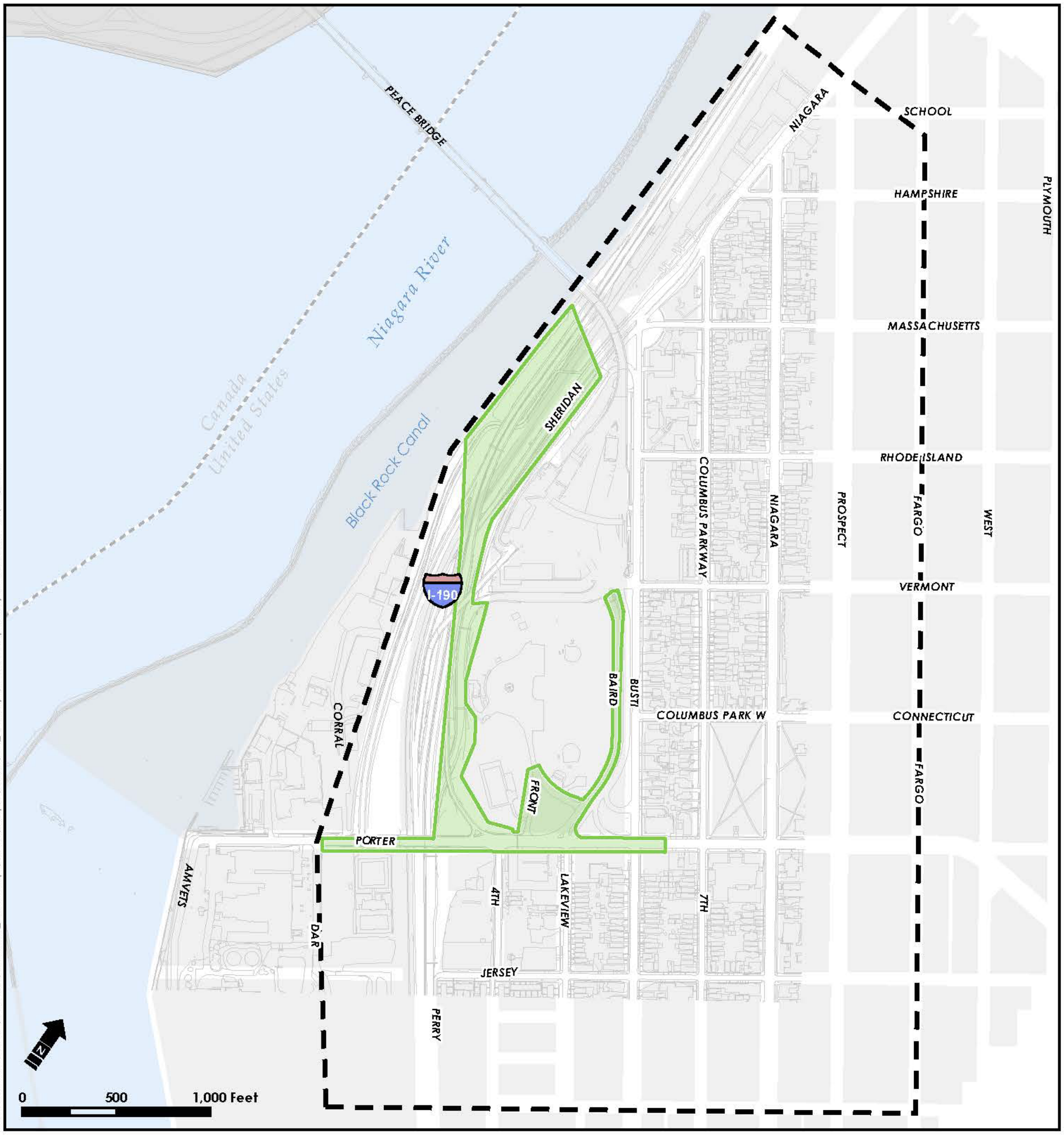
Option A was analyzed in the air quality analysis because, of the two options, ambient air quality concentrations near the intersection would be higher than for Option B. The signal-controlled intersection in Option A would potentially lead to a queue of idling vehicles during the red-phase of the traffic signal. Idling of vehicles would produce higher emissions compared to free-flowing traffic through the roundabout.

2.1 Emission Factor Development

The MOVES model is the required mobile source emission factor model for all mobile source analyses. MOVES provides great flexibility to capture the influence of time of day, car and truck activity, and seasonal weather effects on emission rates from vehicles. MOVES calculates emission-related parameters such as total mass emissions, total energy consumption, vehicle activity (hours operated and miles travelled). From this output, emission rate (e.g., grams/vehicle-mile or grams/hour) can be determined for a wide variety of spatial and time scales.

MOVES has the capability to determine the emission inventory and emission factors at the project-level for a specific group of roadway segments or links. At the project-level, MOVES requires the use site-specific input data for traffic volume, vehicle type, fuel parameters, age distribution, and other input, as discussed below, rather than the use of national default data. By using site-specific data, the emission results reflect the site-specific traffic characteristics for this Project. The capability of MOVES to include project-specific data was exploited in this analysis in order to tailor the MOVES output to describe the emissions from the traffic behavior in the Project's Study Area.

MOVES provides emission and activity data that are used in emission inventory development for the mesoscale, MSAT, greenhouse gas and energy analyses described in later sections. MOVES also provides emission and activity data for development of the emission factors used in the microscale analysis. The methodology discussed here describes the implementation of MOVES to produce the basic data used in the mesoscale, MSAT, greenhouse gas and energy and microscale analyses.



NY Gateway Connections Project
Figure C-1 Air Quality Study Area
Erie County, New York

SOURCE Ecology and Environment, Inc.

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2.1.1 Project Scale, Time Span, Geographic Bounds and Vehicle/Fuel/Road Types

When conducting a project-scale analysis, MOVES requires the analysis to be performed with no preaggregation (i.e., averaging) of input data. This results in the highest precision for emission inventory values and emission rates.

MOVES was run in “inventory mode” using four daily one-hour time periods (6 a.m. to 7 a.m., 11 a.m. to noon, 6 p.m. to 7 p.m., and 11 p.m. to midnight) to represent four daily time periods (morning [6 a.m. to 9 a.m.], mid-day [9 a.m. to 4 p.m.], afternoon [4 p.m. to 7 p.m.] and overnight [7 p.m. to 6 a.m.]). For each daily time period, MOVES was run for four months (January, April, July, and October) to represent the four seasons (winter [December through February], spring [March through May], summer [June through August], and fall [September through November]). These time period combinations were used for the No Build and Build Alternatives for each analysis year (ETC, ETC+10, and ETC+20). A total of 96 MOVES runs were performed for this Project’s analysis.

Other input selections common to all MOVES runs were:

- Geographic bounds: Erie County,
- On-road fuel and vehicle type combinations in the Study Area: diesel fuel – combination long-haul truck and gasoline passenger car, and
- Road types: urban restricted access and urban unrestricted access.

2.1.2 MOVES Processes and Pollutants

For each MOVES run, all processes and pollutants required for the Project analysis were kept the same. The processes “running exhaust,” “crankcase running exhaust,” and for particulate matter “brake wear” and “tire ware” were selected for the analysis to represent the characteristic of traffic within the Study Area because the Project would affect only traffic that is at operating temperature and moving or idling (“running”) on streets in the Study Area. The Project would not affect traffic behavior related to other emission processes available in MOVES, such as starting emissions, extended idling, refueling or evaporative losses; therefore, these processes were not included in the MOVES runs to reduce the complexity of the output files.

An extensive list of pollutants was selected for the MOVES runs and was kept the same for each run. The basic pollutant categories included in each run were criteria pollutants, GHGs, and MSAT. Total energy consumption was also selected since it is needed for greenhouse gas calculations and other pollutant calculations within MOVES. Energy consumption is also required to be reported as part of the NYSDOT Energy and Greenhouse gas analysis guidance.

Criteria pollutants included in MOVES runs were: CO, nitrogen oxides (NO_X), volatile organic compounds (VOCs), sulfur dioxide (SO_2), and particulate matter (PM_{10} and $PM_{2.5}$). For each of these pollutants, MOVES requires that additional pollutants or energy consumption be selected in order to provide a complete determination of emissions. This calculation procedure is based on the "parent-child" relationship established within MOVES for certain pollutants. A "child" pollutant is one that must be calculated prior to determining the concentration of the "parent" pollutant: an example is the relationship between total running primary $PM_{2.5}$ exhaust (parent) and primary $PM_{2.5}$ sulfate particulate (child). Primary $PM_{2.5}$ sulfate particulate is a subset of total running primary $PM_{2.5}$ exhaust. In addition to exhaust PM_{10} and $PM_{2.5}$, brake wear and tire wear PM_{10} and $PM_{2.5}$ were also calculated.

Vehicle-related PM_{10} and $PM_{2.5}$ emissions of dust generated by vehicles traveling on paved and/or unpaved roadways was considered but not included. EPA guidance states that re-entrained road dust be considered in PM microscale (hot-spot) analyses only if EPA has found that dust emissions are a significant contributor in a nonattainment or maintenance area (EPA 2010b). Since the Project is in an air quality area designated as attainment with the PM_{10} and $PM_{2.5}$ National Ambient Air Quality Standards (NAAQS), re-entrained road dust cannot be a significant contributor to a nonattainment situation.

In addition, the Project includes the removal of Baird Drive, which would remove a potential source of paved road dust that is relatively close to residences fronting Front Park. Other roadways affected by the Project include the reconfiguration of the intersection of Porter and 4th Avenues, which would not add new lane miles or a new potential road dust source in the Study Area. The addition of Ramps D and PN would offset the loss of lane miles due to removal of Baird Drive and move a potential source of paved road dust further away from residential areas.

Since the Project would result in an overall reduction in paved lane miles and increase in the distance between potential road dust sources and nearby residences, PM emissions due to re-entrainment of paved road dust were not further considered in the PM analysis.

MOVES was also used to determine GHG emissions. The modeling program uses calculations of total energy consumption and the emissions of individual GHGs (carbon dioxide [CO_2], methane [CH_4], and nitrous oxide [N_2O]) to determine CO_2 equivalent (CO_2e) emissions. CO_2e is the sum of CO_2, CH_4, and N_2O, with the latter two compounds multiplied by their respective global warming potentials included within MOVES.

Finally, MOVES was used to calculate MSAT emissions. The seven priority MSAT's are: acrolein, benzene, 1,3-butadiene, diesel particulate matter/diesel exhaust organic gases (diesel PM), formaldehyde, naphthalene, and polycyclic organic matter (POM). POM consists of 30 individual pollutants in gaseous and particle form.

Figures C-2 and C-3 show the input screen for the process/pollutant portion of MOVES. MOVES provides a 'check box' input procedure for processes/

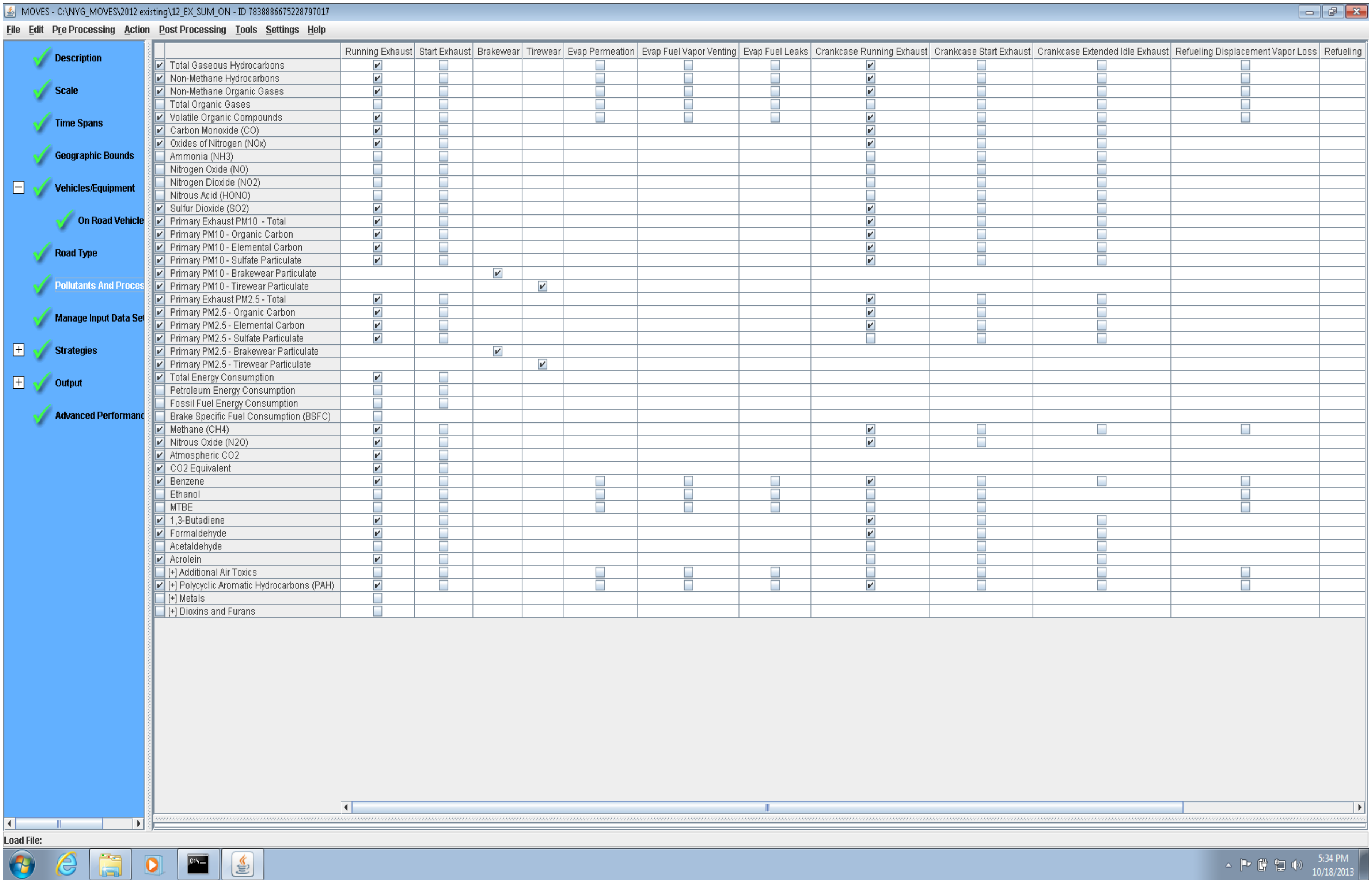


Figure C-2 MOVES Input Screen Showing Pollutants and Processes Selections

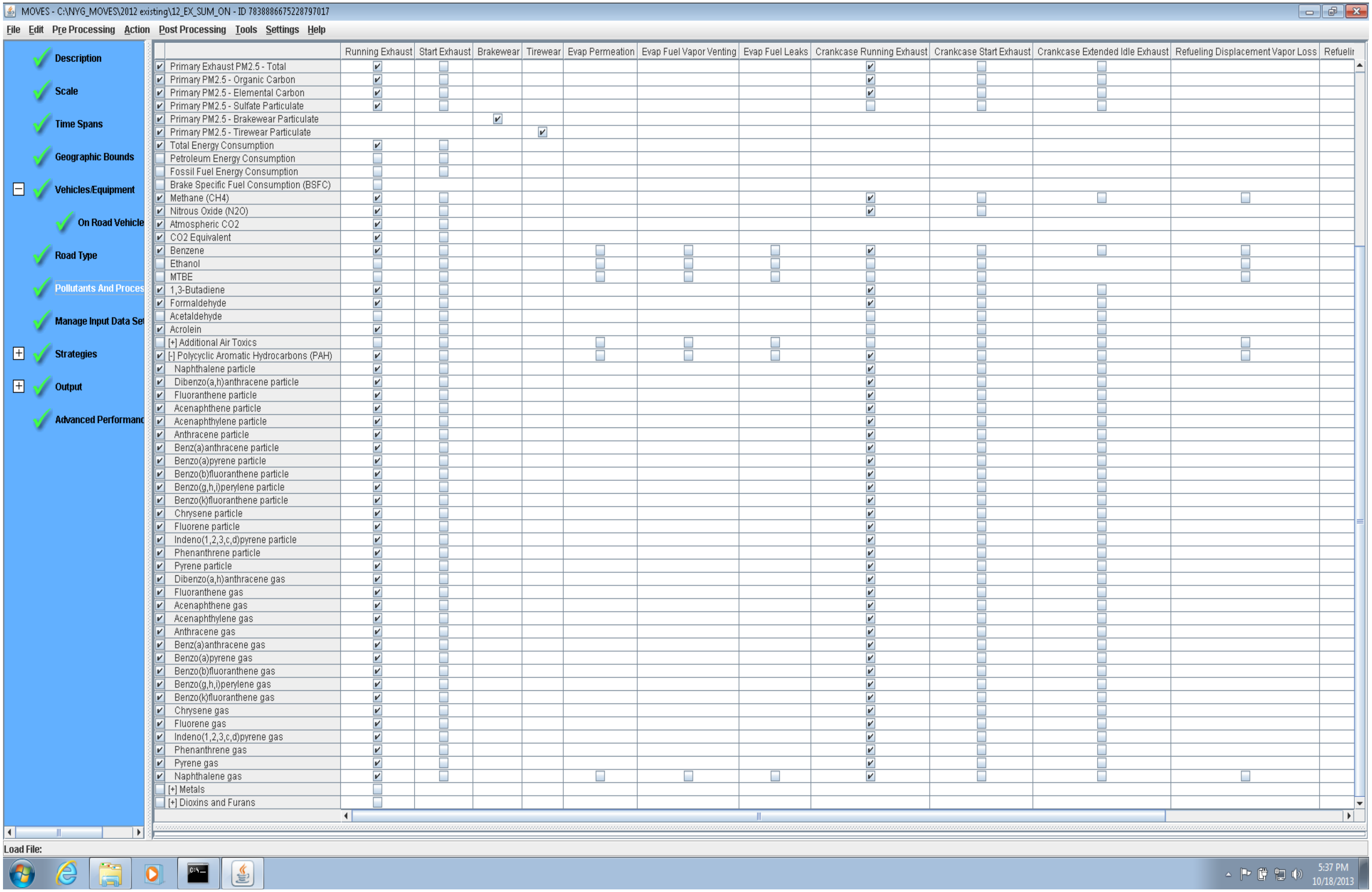


Figure C-3 MOVES Input Screen for Pollutants and Processes Showing Input Selection for PAH (POM)

pollutants. The processes/pollutants shown as ‘checked’ are common to all MOVES runs performed for the Project. Figure C-3 shows the detailed breakout of the 30 pollutants used to determine POM.

2.1.3 Project-Specific Input Data

When run at the Project-scale, MOVES cannot use national default data for certain fuel, vehicle and age distribution, vehicle volumes and vehicle-type distribution data. Instead, Project-specific and Erie County-specific data were imported into MOVES. Erie County-specific data for 2011 was obtained from the NYSDOT and New York State Department of Environmental Conservation (NYSDEC) for fuel supply and fuel formulation (gasoline and diesel), the vehicle emission inspection and maintenance program applicable to the area, meteorology, vehicle-age distribution, and alternative fuel vehicle technology availability.

For Project-specific vehicle data input, a detailed road-link network was used in MOVES to capture vehicle volume (i.e., vehicles per hour), vehicle type (car or trucks), speed, and link type (free-flowing or idle) in the Study Area. A road link, as defined in MOVES, describes a defined segment of road or street that has uniform traffic behavior such as constant volume and speed that results in a unique emission rate. Typically, one road link will be used to describe traffic behavior between intersections. Beyond the intersection or another road juncture point where traffic volume, vehicle-type distribution, and/or speed has changed due to vehicles turning off the link, other vehicles turning onto the link, etc., a different road link is used to describe traffic characteristics since the traffic data in that segment may result in a different emission rate. This detailed link approach was used in order to obtain link-specific emission rates for mesoscale emission inventory development and for use in dispersion modeling.

Project-specific vehicle volume (vehicles per hour) was input for each link in the Study Area road network based on traffic volume diagrams produced in the Traffic Study (see Appendix B – Traffic Analysis). Vehicle volume was input separately for cars and trucks. The speed used for each link was the posted speed limit for the link and is indicative of the running speed on each link. The number of links used in MOVES runs for the No Build and Build alternatives were generally the same; however, the Build Alternative MOVES analysis accounted for the removal of Baird Drive and the addition of Ramps D and PN. This resulted in a slight difference in total links used in MOVES between the No Build Alternative (259) and the Build Alternative (260).

Traffic volume and vehicle-type distribution per link were provided by the traffic study for the ETC year (2015), ETC+10 year (2025), and ETC+20 year (2035). The link data used in MOVES were updated with these volume and vehicle-type data prior to initiating MOVES runs for each analysis year.

2.2 Annual Mesoscale Emissions and Energy Use

The Study Area roadways carry local traffic and traffic from the regional road/highway (mesoscale) network to and from the Peace Bridge Plaza. The Project would allow for direct access to the I-190 northbound from the Plaza via new Ramp D and allow for direct access to the Peace Bridge Plaza entrance ramp from Porter Avenue via new Ramp PN. These two new traffic ramps would allow for the removal of Baird Drive through Front Park. Traffic patterns on the local and arterial streets within the Study Area would be affected by these changes, and some localized changes in traffic volume on some streets would be expected. The Project is not designed to increase overall traffic volume within the Study Area because it is not a capacity-enhancement project.

NYSDOT Guidance requires a mesoscale emission analysis be performed for the No Build Alternative and the Build Alternative. The mesoscale analysis provides a comparison of the overall Project-level emissions from roadways associated with or affected by each alternative.

Peak hourly emissions and energy use for the No Build Alternative and Build Alternative were calculated using MOVES for each meteorological season (winter, spring, summer, and fall) and, within each season, for four daily time periods (a.m. traffic volume peak, midday traffic volume, p.m. traffic volume peak, and overnight traffic volume). The time periods used to define seasons and daily time periods are described in Section 2.1.1. The 16 combinations of season and time-of-day analysis were performed for three analysis years for the Build Alternative and the No Build Alternative: the estimated time of completion (ETC) year of 2015; the ETC+10 year (2025); and the ETC+20 year (2035). Free-flow (moving) traffic-related emissions are included in the mesoscale analysis.

Because it provides total emissions for ETC, ETC+10, and ETC+20, the mesoscale analysis serves to define the critical year to be used in the microscale analysis. The critical analysis year is defined as the year that is most likely to generate the highest annual emissions of each pollutant for each alternative.

The detailed output from the MOVES model runs (found in the "movesoutput" database files) was used to calculate annual mesoscale emissions from the Study Area for the No Build and Build alternatives. The detailed output from MOVES contains 1-hour time period emission totals for the Study Area segregated by link and input data selections (e.g., vehicle type, road type, fuel type, etc.). A series of calculations to rollup segregated emissions in the basic MOVES output from each run was performed to obtain the total emissions by pollutant and total energy use. For example, within the output file for the winter 2015 (ETC year) No Build morning peak period, emission results in the output represent 1- hour of emissions from each link by input data selections such as vehicle type, road type, fuel type, etc. To determine total morning peak period winter emissions for each alternative and analysis year, the emissions from each link were summed to obtain a 1-hour period emission value from all links for all data segregations. This sum was multiplied by the number of hours in the morning peak period (6 a.m. to 9a.m., or 3 hours), then by the number of days in the winter period (December through February). This procedure was repeated for each season, for each analysis year, and for each alternative. Annual emissions of criteria pollutants, GHG, MSAT, and annual energy use were determined using this procedure.

2.3 Microscale Air Quality Analysis

The NYSDOT's TEM and EPA guidance "*Using MOVES in Project-Level Carbon Monoxide Analyses*" prescribe procedures for conducting CO and PM_{10}/$PM_{2.5}$ microscale air quality analyses. A microscale analysis consists of performing dispersion modeling of traffic-related air pollutant emissions for intersections determined to be of concern due to traffic volume changes or proximity of sensitive receptors. The microscale analysis is limited to the Study Area and must be performed for the No Build Alternative and the Build Alternative.

The NYSDOT's TEM guidance specifies that the microscale analysis should be conducted only for the critical analysis year for projects located in areas designated as in attainment or unclassified. Therefore, the microscale air quality analyses for the No Build Alternative and the Build Alternative were performed only for the critical analysis year, since the Project is located in an area that is designated as unclassified attainment for CO, PM_{10} and $PM_{2.5}$. Based on the mesoscale emission inventory, year 2015 (the ETC year) is the critical analysis year for the CO, PM_{10}, and $PM_{2.5}$ analyses.

The microscale air quality analysis consisted of two approaches: one for CO and one for particulate matter (PM_{10} and $PM_{2.5}$). For the CO analysis, a screening methodology was employed per NYSDOT TEM guidance to determine the need to perform a microscale analysis. For the particulate matter analysis, no screening was performed due to the concern and interest expressed regarding particulate matter in the Study Area. For PM_{10} and $PM_{2.5}$, a refined modeling analysis using the EPA's CAL3QHCR dispersion model with emission factors by link from the MOVES model runs was conducted.

2.3.1 Carbon Monoxide

Prior to performing detailed dispersion modeling on a localized basis for CO for the Project's air quality Study Area, the NYSDOT TEM procedures for determining whether a CO microscale analysis is necessary were followed. The procedures include evaluating specific criteria to determining the need for a detailed CO analysis.

The initial screening step is an LOS analysis for the ETC (2015), ETC+10 (2025), and ETC+20 (2035) time horizons for the Build Alternative. LOS describes an intersection's congestion or delay characteristics using a letter designation (A through F). LOS A represents no congestion or delay, whereas F represents the highest levels of congestion and long delays. Intersections with LOS designations of A, B, or C are characterized as having minimal congestion and low potential for causing CO hot spots (i.e., high ambient concentrations of CO) at receptors surrounding the intersection and are not subject to further analysis.

Intersections with LOS designations of D, E, or F are subject to additional screening by capture criteria and volume-threshold techniques described in the NYSDOT TEM. Intersections that fail all screening tests are subject to a CO microscale analysis using the dispersion model CAL3QHC. A refined microscale air quality analysis using CAL3QHCR is performed for those intersections failing the CAL3QHC analysis.

2.3.2 Particulate Matter (PM_{10} and $PM_{2.5}$)

To address concerns expressed during public scoping meetings and in public comments about particulate matter air quality in the Project Study Area, the No Build Alternative and the Build Alternative were subjected to a refined dispersion modeling microscale analysis for PM_{10} and $PM_{2.5}$. Consideration of screening criteria to determine whether particulate matter hot-spot analyses were required was not applied. Input data was processed using the EPA's CAL3QHCR transportation air quality dispersion model to produce projections of ambient PM_{10} and $PM_{2.5}$ concentrations. Inputs to the model consist of detailed information about the roads in the Study Area, such as link length, road segment width, vehicle volume per hour, emission factors, receptor locations, and hourly meteorological data.

Three roadway types were identified in the Study Area: freeways, arterial roads, and local roads. Primary non-freeway roadways within the Study Area (e.g., Niagara Street, Porter Avenue) were included in the arterial road group. Local roads included secondary non-freeway roadways not defined as arterial (e.g., Busti Avenue and 7th Street). Freeways included the I-190 and I-190 on/off ramps.

Vehicle activity on these roads was represented by free-flow links and queue links in CAL3QHCR. A free-flow link is defined as a segment of road having a constant width, height, traffic volume, traffic speed, and vehicle emission factor (i.e., normally moving traffic). A queue link is defined as a straight segment of roadway with a constant width and emission source strength, on which vehicles are idling for a specified period of time (for example, at a traffic control signal). Queue links are also described in the model, with local data used for traffic signal cycle length, red light time, and traffic volume approaching the intersection. The lengths and widths of free-flow links are dependent upon road geometry. The widths of queue links are set equal to lane widths; queue lengths are calculated by the model based on traffic volumes and intersection approach capacities.

A baseline set of road links was used to characterize the No Build road configuration. Free-flow and queue links were modified, added, or deleted to account for the road configuration of the Build Alternative. Table C-1 summarizes the additions and removals captured in the link network for the Build Alternative represented in the CAL3QHCR model for the PM_{10} and $PM_{2.5}$ microscale analysis.

Table C-1 Road and Traffic Signal Changes for the Build Alternative

Location	Modification
Niagara Street/Porter Avenue	Modify traffic signal timing
Porter Avenue between Niagara Street and I-190	Modify traffic signal timing
Ramp PN and Ramp D	Construct ramp PN to carry traffic from Porter to Ramp N. Construct ramp D to carry traffic from the Peace Bridge Plaza to the I-190 northbound.
Porter Avenue/4th Street Intersection	Reconfigure lanes and add traffic control signal
Baird Drive	Remove

A complete description of the traffic analysis, including projection methods, is provided in Appendix B – Traffic Analysis.

Emission factors for use in microscale modeling were developed from MOVES emission and vehicle-activity output data. Emission factors for each free flow road link in the Project Study Area were determined by dividing rolled up emissions on each link by miles travelled on each link by vehicle type (car or truck). Idle emission factors (grams/vehicle-hour) were determined by dividing rolled up emissions for each queue link by vehicle-hours idling segregated by vehicle type (car or truck).. Project-specific car and truck volume distribution by road link were used to combine vehicle-specific emission factors to develop traffic-volume-weighted hourly average emission factors for each link. The traffic-volume-weighted hourly average emission factor on the link represents what a receptor would experience over an hour time period with a blend of cars and trucks passing by the receptor location.

2.3.2.1 Receptor Locations

The receptor locations were positioned according to criteria outlined in the NYSDOT TEM and USEPA guidance. Receptors were placed at each corner of an intersection and at the middle of each block along roads and streets in the Study Area. Approximately 580 receptor locations were used in the microscale modeling analysis for PM_{10} and $PM_{2.5}$.

For the Build Alternative analysis, the No Build receptor data set was edited to remove, relocate, or add receptor locations to account for the removal of Baird Drive, the addition of Ramps PN and D, and the configuration of the signalized intersection at Porter Avenue and 4th Street. The procedure used in the placement of new or relocated receptors was based on criteria outlined in the NYSDOT TEM and USEPA guidance.

2.3.2.2 Background PM_{10} and $PM_{2.5}$ Concentrations

In accordance with the Clean Air Act (CAA) amendments, the EPA has designated NAAQS for seven criteria air pollutants: sulfur dioxide (SO_2), particulate matter less than or equal to 10 micrometers in diameter (PM_{10}), particulate matter less than or equal to 2.5 micrometers in diameter ($PM_{2.5}$), CO, ozone (O_3), nitrogen dioxide (NO_2), and lead. As part of its statewide ambient air monitoring system, NYSDEC operates monitoring stations that measure ambient air concentrations of these pollutants in Erie County (in Amherst, Buffalo, and Tonawanda) and in Niagara County (in Niagara Falls).

NYSDEC prepares an annual monitoring plan that describes the rationale for the placement of sampling sites and selection of pollutants for ambient monitoring and changes that are made to the monitoring network. Pollutants for which local monitoring stations have a long history of demonstrating compliance with the NAAQS may be removed from the monitoring network plan. For new NAAQS, the monitoring network is adjusted to provide measurements for comparison to new standards. For example, monitoring for lead was discontinued at the end of 2004, and monitoring for PM_{10} is no longer performed in western New York (NYSDEC Region 9), as long-term data have demonstrated compliance with the NAAQS.

In addition to the annual network plan, NYSDEC also produces a report of ambient monitoring data. Monitoring data from NYSDEC's 2012 ambient monitoring network as reported on the EPA Air Data database are shown in Table C-2 (EPA 2013).

A focused sampling study in the neighborhood around the Plaza and Front Park is being performed by NYSDEC in two phases. The goal of the sampling program is to characterize local air quality by comparing "upwind" and "downwind" data prior to prospective renovations of the Plaza. The first phase (before prospective renovations being performed by others) began on September 14, 2012, and ended on March 26, 2013. The second phase (after renovations) will be conducted at an as yet undetermined date. A complete description of the sampling study methodology and sampling results from the first phase of sampling can be found on the NYSDEC website (NYSDEC 2013).

Other ambient monitoring studies have been conducted in previous years in the Project air quality study area. PM_{10} and $PM_{2.5}$ concentration data in the Project Area were gathered for a previous study in the same vicinity as the NYSDEC sampling program. The study included a short duration sampling program that was performed over a six-week period late in 2001 and during a second six-week sampling program in early 2002. A comparison of the upwind and downwind sampling data from the study showed that ambient levels of PM_{10} and $PM_{2.5}$ in the vicinity of the Plaza is highly influenced by non-Plaza emission sources but lower than the NAAQS. Additional ambient air monitoring studies in the Project area have been conducted by various research scientists over the last 10 years by Clarkson University and the University at Buffalo. Appendix B of the NYSDEC Peace Bridge Study Report summarizes results from the other monitoring studies (NYSDEC 2013).

Table C-2 Criteria Air Pollutant Summary (2012 Data)

Pollutant	Air Monitoring Station	Averaging Time	Monitored Concentration[1]	NAAQS
Sulfur dioxide	Tonawanda (192 Brookside Terrace West)	Primary 1-hour	26 ppb	75 ppb
		Secondary 3-Hour	Not reported	0.5 ppm(2)
Inhalable particulates (PM_{10})[8]	None in NYSDEC Region 9	Primary and Secondary 24-Hour	No monitoring sites in NYSDEC Region 9	150 µg/m^3 (3)
Fine inhalable particulates ($PM_{2.5}$)	Buffalo (185 Dingens)	Primary Annual	9.4 µg/m^3	12 µg/m^3 (4)
		24-Hour 98th Percentile	23 µg/m^3	35 µg/m^3 (5)
Carbon monoxide	Buffalo (185 Dingens)	8-Hour (running average, 2nd highest)	1.1 ppm	9 ppm(2)
		1-Hour (2nd highest)	1.6 ppm	35 ppm(2)
Ozone	Amherst (Audubon Golf Course)	8-Hour	0.073 (3 yr avg) 0.079 (2012) 0.068 (2011) 0.072 (2010)	0.075 ppm(6)
Nitrogen dioxide	Amherst Buffalo	1-hour	32 ppb (Audubon) 46 ppb (Dingens)	100 ppb(7)
Lead	None in NYSDEC Region 9	Rolling 3-month average	No monitoring sites in NYSDEC Region 9	0.15 µg/m^3

Source: EPA 2013.

1 Monitored concentration shown is value for calendar year 2012. For some pollutants (NO_2 1-hour, ozone 8-hour, $PM_{2.5}$ annual and 24-hour and SO_2 1-hour) additional years are included to determine 3 year average to determine NAAQS compliance.
2 Not to be exceeded more than once per year.
3 Not to be exceeded more than once per year on average over 3 years.
4 Average of last 3 years annual means not to exceed standard.
5 Standard is compared to average of 98th percentile for last 3 years.
6 Standard compared to 4th highest daily 8-hour average concentration measured during the last 3 years.
7 98th percentile averaged over 3 years.
8 There are no NYSDEC monitoring sites for PM10 due the WNY region's long-term compliance with the NAAQS.

Key:
NAAQS = National Ambient Air Quality Standards

2.3.3 Mobile Source Air Toxics (MSAT)

A quantitative analysis was conducted to determine annual emissions of MSATs emitted from vehicles in the air quality Study Area. Annual MSAT emissions for the No Build Alternative and the Build Alternative were determined in accordance with the FHWA's "Interim Guidance Update on Air Toxic Analysis in NEPA Documents" (FHWA 2012). The seven priority MSAT's are: acrolein, benzene, 1,3-butadiene, diesel particulate matter/diesel exhaust organic gases (diesel PM), formaldehyde, naphthalene, and polycyclic organic matter (POM). POM consists of 30 individual pollutants in gaseous and particle form. MSAT annual emissions were determined using the MOVES model run in emission inventory mode. MOVES is based on in-use vehicle data, including millions of emissions measurements from light-duty vehicles. MOVES also accounts for the effects that vehicle speed and temperature have on PM emissions estimates (FHWA 2012).

For the No Build Alternative and the Build Alternative, the amount of MSATs emitted would be proportional to the vehicle miles traveled (VMT) and delay time (e.g., amount of time spent idling or in slow speed operation). Other variables that might affect MSAT emissions, such as vehicle fleet mix, are assumed to be the same for each alternative.

3 Findings

3.1 Mesoscale Emissions and Critical Analysis Year

NYSDOT guidance specifies that, for projects located in attainment areas, the microscale analysis needs to be conducted only for the critical analysis year. Therefore, the microscale air quality analyses for the No Build Alternative and the Build Alternative were performed only for the critical analysis year, since the Project is located in an area that is designated as unclassified/attainment for CO, PM_{10} and $PM_{2.5}$. The critical analysis year is defined as the year that is most likely to generate the highest emissions of each pollutant for each alternative. If the microscale analyses for the alternatives using traffic and emission factor data for the critical analysis year do not show an exceedance of the NAAQS or potential impact threshold, then no exceedances are expected in any other year within the design period.

The critical analysis year was determined by comparing the peak hourly emissions from the No Build Alternative and Build Alternative for ETC (2015), ETC+10 (2025), and ETC+20 (2035). Total hourly emissions for each season/time of day/analysis year combination were calculated by summing the peak hourly emissions of each free-flow link included in the MOVES run.
Peak hourly emissions are compared in Tables C-3 and C-4 for the No Build Alternative and the Build Alternative. Peak emissions occur in the ETC year (2015); therefore, 2015 is the critical analysis year for $PM_{2.5}$, and PM_{10} evaluation.

Table C-3 Peak Hourly $PM_{2.5}$ Emissions (grams per hour) from MOVES – No Build Alternative, 2015, 2025, 2035

	Time of Day			
Season	A.M. Peak	Midday	P.M. Peak	Overnight
2015				
Winter	6,266	4,693	5,380	860
Spring	4,723	3,786	3,454	627
Summer	3,781	2,876	2,871	475
Fall	4,798	3,005	3,448	575
2025				
Winter	4,962	3,812	4,715	742
Spring	3,321	2,330	2,612	483
Summer	2,354	1,644	1,840	312
Fall	2,354	1,644	1,840	312

Table C-3 Peak Hourly $PM_{2.5}$ Emissions (grams per hour) from MOVES – No Build Alternative, 2015, 2025, 2035

Season	Time of Day			
	A.M. Peak	Midday	P.M. Peak	Overnight
2035				
Winter	4,466	3,529	4,584	719
Spring	2,748	1,968	2,322	432
Summer	1,742	1,289	1,504	245
Fall	2,424	1,708	2,017	368

Table C-4 Peak Hourly PM2.5 Emissions (grams per hour) from MOVES – Build Alternative, 2015, 2025, 2035

Year/Season	Time of Day			
	A.M. Peak	Mid-day	P.M. Peak	Overnight
2015				
Winter	6,031	4,549	5,205	836
Spring	4,512	3,231	3,352	586
Summer	3,645	2,538	2,693	447
Fall	4,268	2,950	3,098	542
2025				
Winter	5,025	3,790	4,542	728
Spring	3,197	2,448	2,539	451
Summer	2,263	1,689	1,816	296
Fall	2,897	2,073	2,262	402
2035				
Winter	4,303	3,597	4,411	702
Spring	2,648	2,054	2,244	401
Summer	1,675	1,259	1,462	233
Fall	2,337	1,740	1,941	348

The mesoscale analysis provides an estimate of total annual emissions of criteria pollutants from vehicle activity on all roadways in the Air Quality Study Area. Annual emissions were obtained from MOVES runs performed as described in Section 2.1. Annual emissions for ETC (2015), ETC+10 (2025), and ETC+20 (2035) and the difference in annual mesoscale emissions between the No Build Alternative and the Build Alternative are shown in Table C-5.

Comparing 2015, 2025, and 2035 traffic-related emissions in the Air Quality Study Area, a downward trend is seen for the No Build Alternative and the Build Alternative. The decrease is most likely due to improvements in vehicle emission control technology, cleaner fuels, and fleet turnover. In 2015, 2025 and 2035, the emissions from the Build Alternative are lower for all pollutants compared to the No Build Alternative. The lower emissions for the Build Alternative compared to the No Build Alternative are likely the result of traffic flow efficiency improvements due to the Project and mitigation measures applied in the Build Alternative in later years as described in the Traffic Study (see Appendix B – Traffic Study).

The No Build Alternative does not include mitigation for the predicted growth in traffic volume over the 20-year time period.

Table C-5 Mesoscale Emissions from Roadways in the Study Area

Alternatives	Emissions (tons per year)				
	CO	NO_2	VOCs	PM_{10}	$PM_{2.5}$
2015					
No Build	1,502	396	130	25	24
Build	1,434	373	124	23.3	22.2
Build – No Build	-68	-23	-6	-2	-1
2025					
No Build	491	193	49	18.0	16.9
Build	483	187	48	17.8	16.7
Build – No Build	-8	-6	-1	-0.2	-0.2
2035					
No Build	216	88	13	15.7	14.7
Build	155	61	9.0	11.1	10.4
Build – No Build	-61	-27	-4	-4.6	-4.3

3.2 Microscale Analysis

3.2.1 CO

The potential for CO hot spots for the Build Alternative were evaluated based on the methodology discussed in Section 2.3.1. Predicted LOS ratings for Study Area intersections (see Appendix B – Traffic Study) were used to initially screen intersections to determine whether a more detailed analysis was required. Table C-6 summarizes the results of the LOS analysis for the Build Alternative signalized intersection option for years 2015, 2025, and 2035 from the traffic study for key intersections in the Porter Avenue corridor. These intersections are directly affected by the Build Alternative traffic pattern changes. The LOS analysis includes the application of mitigation measures to alleviate impacts associated with the Build Alternative. These mitigation measures include: installation of a traffic signal at Porter Avenue and Ramps P and PN; modification of traffic signal phasing and/or timing along Porter Avenue at intersections with Niagara Street, Busti Avenue, and Lakeview Avenue; and optimization of traffic signal offsets along Porter Avenue.

The five intersections shown in Table C-6 have an LOS of A, B, C, or D. Except for the weekday PM peak hour in 2025 and 2035, the intersections in Table C-6 meet the screening criteria exempting them from further analysis for CO hot spots. Additional LOS results for remaining intersections in the Study Area are presented in Appendix B - Traffic Study.

Table C-6 Level of Service for Porter Avenue Intersections in the Project Area

Intersection	Weekday AM Peak Hour			Weekday PM Peak Hour		
	2015	2025	2035	2015	2025	2035
Porter / Niagara St	B	B	B	C	D	D
Porter / Columbus Pkwy / 7th Avenue	B	B	B	B	B	B
Porter/Busti	A	A	A	A	A	A
Porter / Lakeview / Front Park	B	B	B	A	A	A
Porter / Ramps P & PN	B	C	C	B	B	B

Note: The Build Alternative in this analysis reflects on the signalized intersection option, which results in the worst case air quality condition for the Build Alternative. Additional LOS analysis results for intersections in the Study Area are shown in the traffic study report.

The Porter Avenue/Niagara Street intersection for the weekday PM peak hour was further evaluated using capture criteria screening as prescribed in the NYSDOT TEM and described in Section 2.3.1. The criteria include:

1) A 10% or more reduction in the source-receptor distance;
2) A 10% or more increase in traffic volume on affected roadways for 2015, 2025 or 2035;
3) A 10% or more increase in vehicle emissions for 2015, 2025 or 2035;
4) Any increase in the number of queue lanes for 2015, 2025 or 2035; and
5) A 20% reduction in speed, when Build Alternative estimated average speed is 30 mph or less.

For the Porter Avenue/Niagara Street intersection for the weekday PM peak hour, the result of evaluating the intersection against the capture criteria screening are as follows:

1) There are no intersection widening or configuration changes that are part of the Build Alternative that will reduce the source-receptor distance; therefore there will not be a 10% or more reduction in source-receptor distance compared to the No Build Alternative.
2) An analysis of traffic volume changes during the weekday PM peak hour for 2015, 2025 and 2035 shows there is no difference between the Build Alternative and No Build Alternative total traffic volume through the intersection. The analysis summed the through, right turn and left turn movements from all four entry points into the intersection. Therefore, there will not be a 10% or more increase in traffic volume compared to the No Build Alternative.
3) Corresponding to the traffic volume analysis, an analysis of the emissions for the intersection indicates that there will not be a 10% or more increase in vehicle emissions for 2015, 2025 and 2035 when comparing the Build Alternative to the No Build Alternative.

4) The number of queue lanes will not increase in 2015, 2025 or 2035; and
5) There will not be a speed reduction for the Build Alternative when compared to the No Build Alternative.

Therefore, the Porter Avenue/Niagara Street weekday PM peak hour intersection condition does not require a CO hot spot analysis for the Project.

3.2.2 Particulate Matter

As noted earlier, screening procedures to define intersections that may be eliminated as potential hot spots for particulate matter were not performed. Instead, the entire Study Area was subject to a refined air quality analysis for particulate matter due to the heightened concerns expressed at public meetings regarding the impact of particulate matter in the Study Area.

The refined dispersion modeling analysis utilized hourly surface meteorological data and twice-daily upper air data. The meteorological data set covered the five-year period from 1997 to 2001 and encompasses the wide variety of weather conditions experienced in the Study Area. Surface meteorological data originated from two sources: for 1997 through 1999, surface data from the Greater Buffalo International Airport were used; for 2000 and 2001, surface data from Buffalo State College's Great Lakes Field Station (GLFS) were used. Upper air data for the 5-year period were obtained from the Greater Buffalo International Airport.

The GLFS site is the preferred source for surface meteorological data since it is much closer to the Study Area (approximately 0.25 miles west of Front Park) than the Greater Buffalo International Airport (approximately 15 miles east of this Study Area). The GLFS did not collect data prior to year 2000 or after 2001, necessitating the use of data from Greater Buffalo International Airport to complete the 5-year data set.

For the dispersion modeling analysis, the critical year (2015) worst-case hourly emission rates for each link from MOVES runs were used in the dispersion model CAL3QHCR. The worst-case hourly emission rate was found to occur during the winter in the morning peak traffic period. These hourly rates were conservatively assumed to apply to each hour of each day in the year.

Microscale air quality modeling results for particulate matter are shown in Table C-7 (for PM_{10}) and Table C-8 (for $PM_{2.5}$). Results from the modeling show that ambient air quality concentrations are in compliance with the NAAQS and that there is no difference between the No Build Alternative and the Build Alternative.

Table C-7 PM$_{10}$ Modeled Concentrations for the Build Alternative and the No Build Alternative in the Critical Analysis Year 2015

Meteorological Data Year	Concentration (µg/m^3) 24-Hour Averaging Period 1st High	2nd High	3rd High	4th High	Annual
Year 1 Build	6.69	6.24	6.06	6.02	3.22
Year 1 No Build	6.44	6.04	5.86	5.82	3.11
Year 2 Build	7.67	7.20	6.99	6.86	3.41
Year 2 No Build	7.40	6.95	6.74	6.64	3.30
Year 3 Build	7.14	6.90	6.67	6.50	3.28
Year 3 No Build	6.91	6.68	6.44	6.28	3.17
Year 4 Build	12.4	12.3	9.37	9.08	3.81
Year 4 No Build	12.0	11.9	9.04	8.80	3.68
Year 5 Build	9.86	9.80	9.73	9.55	4.12
Year 5 No Build	9.52	9.46	9.39	9.22	3.98

Notes:
1. PM$_{10}$ concentrations do not include background concentrations. As discussed in section 2.3.2.2, PM$_{10}$ is not monitored in NYSDEC Region 9.
2. Critical year is 2015.
3. Annual NAAQS for PM$_{10}$ was revoked by the EPA. The 24-hour NAAQS is 150 µg/m^3.

Table C-8 PM$_{2.5}$ Modeled Concentrations for the Build Alternative and the No Build Alternative in the Critical Analysis Year 2015

Meteorological Data Year	Concentration (µg/m^3) 24-Hour Averaging Period 1st High	2nd High	3rd High	4th High	Annual
Year 1 Build	3.50	2.61	2.54	2.51	1.28
Year 1 No Build	3.21	2.90	2.77	2.74	1.24
Year 2 Build	3.08	2.87	2.83	2.81	1.36
Year 2 No Build	3.40	3.36	3.14	2.95	1.32
Year 3 Build	2.99	2.85	2.79	2.73	1.31
Year 3 No Build	3.21	3.16	3.12	3.08	1.30
Year 4 Build	5.55	5.53	5.11	4.31	1.55
Year 4 No Build	5.89	5.83	5.79	4.85	1.53
Year 5 Build	4.73	4.37	4.18	3.97	1.69
Year 5 No Build	5.27	4.74	4.58	4.57	1.68

Notes:
1. PM$_{2.5}$ concentrations shown do not include background concentration.
2. Critical year is 2015.
3. Annual NAAQS for PM$_{2.5}$ is 12 µg/m3; 24-hour NAAQS for PM$_{2.5}$ is 35 µg/m3 based on a 3-year average of the 98th percentile (4th highest 24-hour concentration)

The predicted ambient concentrations shown in Table C-7 are well below the NAAQS value of 150 µg/m^3 for the 24-hour time period. The concentrations shown do not include a background value because ambient monitoring for PM$_{10}$ in western New York ceased several years ago. The results of multiple years of monitoring activity have shown that regional PM$_{10}$ concentrations are substantially less than the NAAQS and repeatedly demonstrated compliance with the NAAQS.

The modeled differences between the ambient concentrations predicted for the No Build Alternative and the Build Alternative shown in Table C-7 are small. Concentration differences range from 0.2 to 0.4 $\mu g/m^3$.

Similar to the PM_{10} modeling results, predicted ambient concentrations for $PM_{2.5}$ shown in Table C-8 are well below the respective NAAQS values. The 24-hour NAAQS for $PM_{2.5}$ of 35 $\mu g/m^3$ is a statistical value based on the 3-year average of the 98th percentile value of 24-hour concentrations. The annual primary NAAQS for $PM_{2.5}$ of 12 $\mu g/m^3$ is a statistical value based on the annual mean averaged over 3 years.

Background concentration of $PM_{2.5}$ for the Study Area from the recently completed NYSDEC sampling study in the Study Area is not of sufficient duration to form a background value that meets the statistical requirements for use in comparison to the NAAQS. However, the monitoring station at the NYSDEC Dingens Street site in Buffalo is used to represent a regional $PM_{2.5}$ background concentration.

The determination of compliance for the modeled concentrations for $PM_{2.5}$ for the Build Alternative was performed following EPA guidance (EPA 2010b). The first-tier analysis option from the EPA guidance was used for the Build Alternative. The highest 24-hour concentration values from each year of modeling were averaged together and added to the 3-year average 98th percentile 24-hour background concentration and rounded to the nearest 1 $\mu g/m^3$. The average of the highest modeled concentrations is 4 $\mu g/m^3$. Adding this value to the background value of 23 $\mu g/m^3$, shown in Table C-2, results in a total concentration of 27 $\mu g/m^3$; the NAAQS is 35 $\mu g/m^3$. The annual mean modeling results averaged over 3 years is 1.5 $\mu g/m^3$ (using years 3, 4, and 5 to form the average). Adding this value to the annual background value of 9.4 $\mu g/m^3$ shown in Table C-2 results in a total annual concentration of 10.9 $\mu g/m^3$; the annual NAAQS is 12 $\mu g/m^3$.

The differences between the 24-hour ambient concentrations predicted for the No Build Alternative and the Build Alternative shown in Table C-8 are small. Concentration differences range from 0.2 to 0.5 $\mu g/m^3$.

The receptor location showing the maximum concentration is along the I-190 northbound, near Porter Avenue. Figures C-4 and C-5 present contours illustrating $PM_{2.5}$ concentrations in the air quality Study Area resulting from the No Build Alternative and the Build Alternative. As shown on the figures, the lowest concentrations occur in residential areas, with higher concentrations occurring along the I-190 corridor and decreasing in concentration with distance from major roadways.

The data used to depict the ambient concentrations on Figures C-4 and C-5 are the result of modeling and consider only the roadway sources in the immediate Study

Area. The data do not include the background pollutant levels from multiple sources outside of the Study Area.

3.3 Energy and Greenhouse Gas

The energy analysis included a comparison of the direct and indirect energy consumption associated with the No Build Alternative and the Build Alternative.

Direct energy consumption is defined as the energy capacity of fuel combusted in vehicles using the roadways in the Study Area. The estimated annual direct energy consumption for each alternative was calculated with the MOVES model. Energy consumption was calculated in the same MOVES model run used to calculate criteria air pollutant, MSAT, and GHG emissions. A description of the MOVES model runs for energy and GHGs is included in Section 2.2.

Indirect energy consumption is defined as the energy capacity of fuel combusted in equipment used to construct and maintain the roadways impacted by the Project. Annualized indirect energy consumption due to Project construction and annual indirect energy consumption due to roadway maintenance was estimated for each alternative using approaches outlined in NYSDOT's *Draft Energy Analysis Guidelines for Project-Level Analysis* (NYSDOT 2003a). Input data for the analysis included cost of construction and price trend data for 2014 from the NYSDOT guidance. Annualized construction energy consumption was estimated by dividing total construction energy consumption by a project horizon of 20 years. For the roadway maintenance energy calculation, lane-mile values of 3.5 miles and 3 miles were used for the No Build Alternative and Build Alternative, respectively. These distance values consider the roads and/or ramps that vehicles use to enter the Plaza from Porter Avenue and to exit the Plaza to access northbound I-190 under the No Build Alternative and Build Alternative.

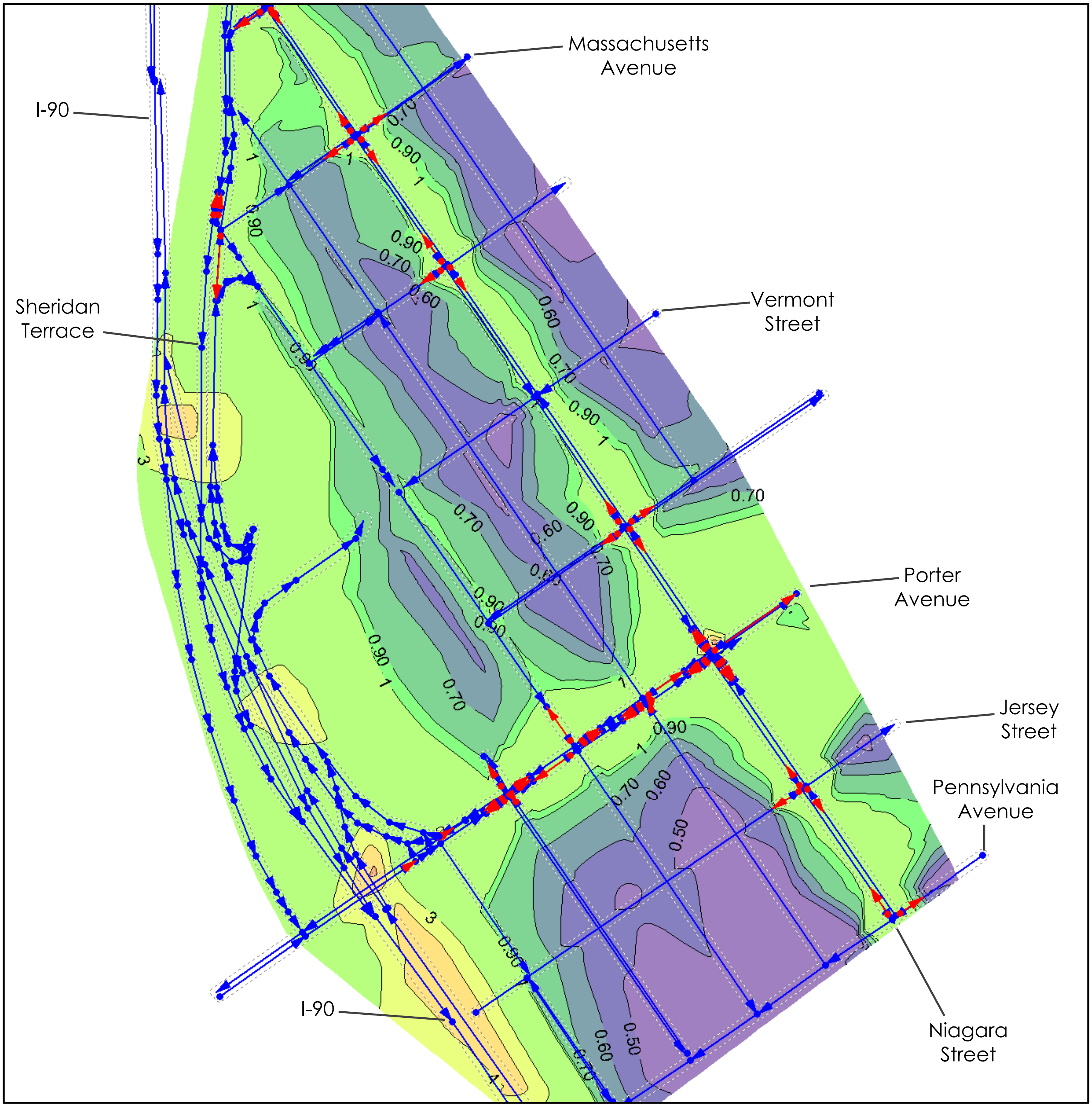
A comparison of the estimated annual direct and indirect energy consumption for both the No Build and Build Alternatives is presented in Table C-9.

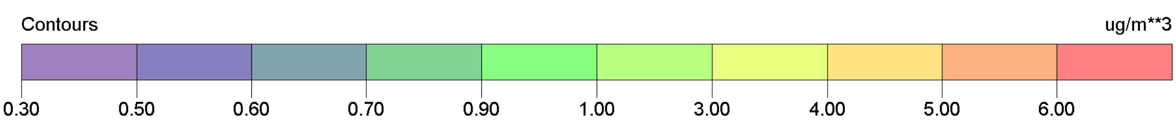
Table C-9 Annual Energy Consumption

Alternative	Direct Energy Consumption (MMBtu/yr)	Indirect Energy Consumption (MMBtu/yr)		Total Energy Consumption (MMBtu/yr)	Total Energy Consumption Relative to No Build Alternative (MMBtu/yr)
		Construction[1]	Maintenance		
No Build Alternative	3,423,160	0	622	3,428,782	-
Build Alternative	3,361,500	17,793	533	3,379,826	-48,956 (-1.4%)

Total construction energy consumption annualized over a period of 20 years.

Key:
MMBtu/yr = million British thermal units per year.





Comments:
Pollutant - PM25
Met Data Year - 2000

Model: CAL3QHCR
Max: 5.55
Units: ug/m**3
Links: 251
Receptors: 567
Date: 10/9/2013

Road Link with Idling Vehicles

Road Link with Moving Vehicles

NY Gateway Project
Build Alternative - PM 25
24-Hour Maximum Concentration
Critical Year 2015
Erie County, New York

SOURCE Ecology and Environment, Inc.

CALRoads View-Lakes Environmental Software

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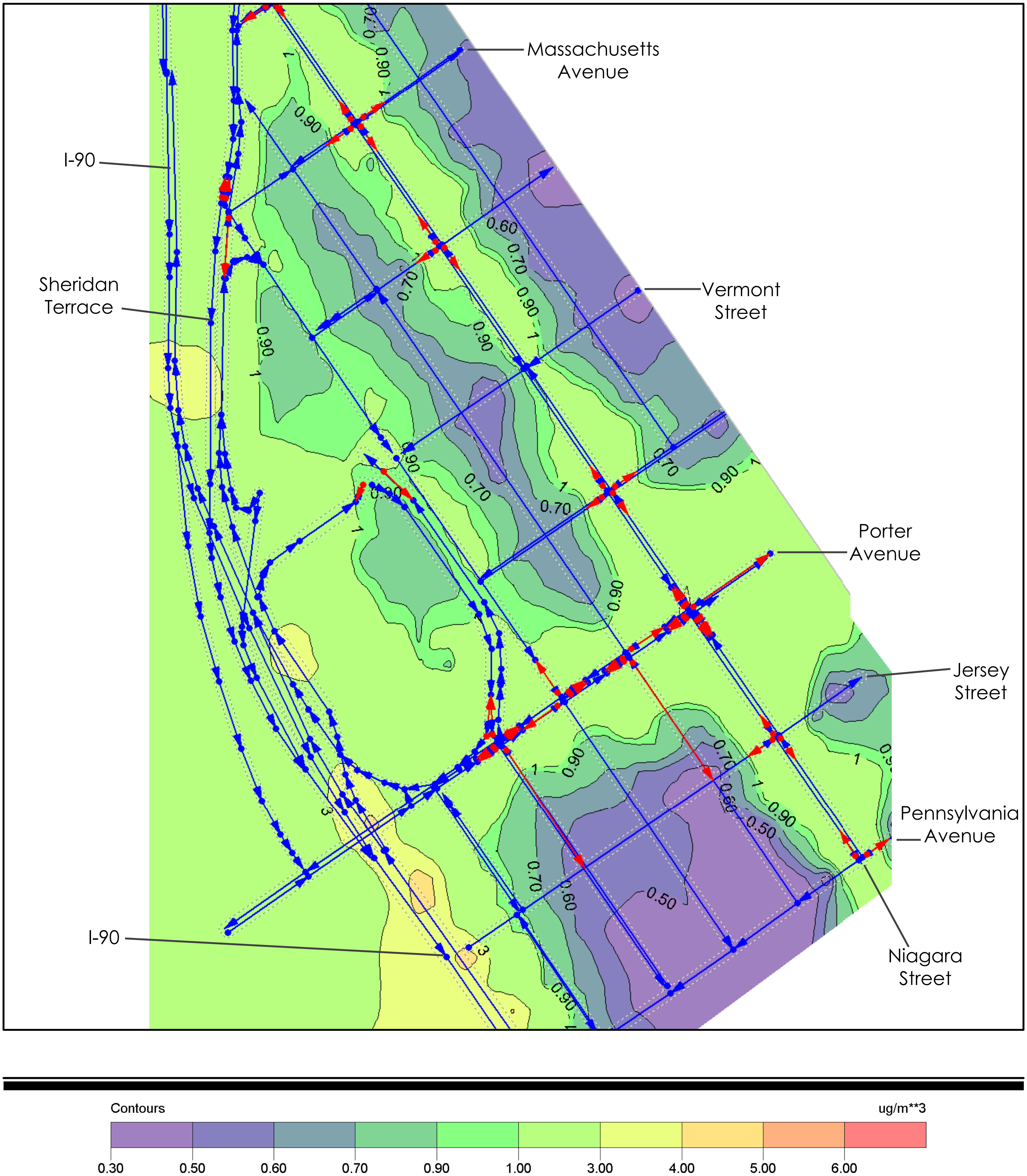

Comments:
Pollutant - PM25
Met Data Year - 2000

Model: CAL3QHCR
Max: 5.89
Units: ug/m**3
Links: 258
Receptors: 567
Date: 10/8/2013

Road Link with Idling Vehicles
Road Link with Moving Vehicles

NY Gateway Project
No Build Alternative - PM 25
24-Hour Maximum Concentration
Critical Year 2015
Erie County, New York

SOURCE Ecology and Environment, Inc.

CALRoads View-Lakes Environmental Software

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The analysis indicates that long-term annual total energy consumption would be reduced by 1.4% with the Build Alternative as compared to the No Build Alternative. The total energy consumption rate includes the contribution from vehicles operating on the roadways following construction (direct energy consumption) and from construction activities and roadway maintenance (indirect energy consumption). The reduction in energy consumption likely reflects the effect of the more direct access to northbound I-190 under the Build Alternative. The direct access from the Plaza to northbound I-190 via Ramp D reduces vehicle miles traveled compared to the No Build Alternative for vehicles exiting the Plaza to northbound I-190; under the No Build Alternative, vehicles exiting the Plaza take a less direct, hence longer, route to reach northbound I-190 by having to travel through Front Park on Baird Drive to Porter Avenue to the northbound I-190 entrance Ramp P.

The burning of fossil fuels in vehicles and non-road equipment would produce GHG emissions, primarily CO_2. The GHG emissions analysis included a comparison of the direct and indirect GHG emissions associated with the No Build Alternative and the Build Alternative. Direct GHG emissions are generated from the long-term fuel combustion in vehicles using the roadways in the Study Area. The annual GHG emissions for each alternative were estimated with the MOVES model. MOVES calculates emissions of three GHGs: carbon dioxide, methane, and nitrous oxide. MOVES applies global warming potential (GWP) factors to carbon dioxide (carbon dioxide is the reference GHG with a GWP of 1), methane (GWP of 21) and nitrous oxide (GWP of 310) and then sums emissions to produce a direct GHG emission value in terms of carbon dioxide equivalent (CO2e). GHG emissions were calculated in the same MOVES model runs used to calculate criteria air pollutant emissions, MSATs, and energy consumption.

Indirect GHG emissions are generated from fuel combustion in equipment used to construct and maintain the roadways impacted by the Project. Annualized GHG emissions associated with project construction and annual GHG emissions associated with road maintenance for each alternative were calculated following the procedures in NYSDOT's *Draft Greenhouse Gases (CO_2) Emissions Estimate Guidelines for Project-Level Analysis* (NYSDOT 2003b). Following these procedures, indirect GHG emissions were estimated based on the indirect energy consumption calculated for construction and roadway maintenance.

A comparison of the estimated annual direct and indirect GHG emissions for each alternative is presented in Table C-10.

Long-term annual GHG emissions would be reduced by 1.3% with the Build Alternative as compared to the No Build Alternative. The total GHG emissions include the contributions from vehicles operating on the roadways following construction (direct GHG emissions) and from construction activities and roadway maintenance (indirect GHG emissions). As with annual energy consumption, the reduction in GHG emissions is associated with the more efficient traffic pattern associated with vehicles exiting the Plaza to northbound I-190.

Table C-10 Annual Greenhouse Gas Emissions

Alternative	Direct GHG Emissions (tons CO_2e/year)	Indirect GHG Emissions[1] (tons CO_2e/year)	Total GHG Emissions (tons CO_2e /year)	Total GHG Emissions Relative to No Build Alternative (tons CO_2e /year)
No Build Alternative	288,322	50	288,372	-
Build Alternative	283,099	1,576	284,675	-3,697 (-1.3%)

[1] Indirect emissions from construction and long-term maintenance. Emissions from construction annualized over a period of 20 years.

3.4 Mobile Source Air Toxics

Table C-11 shows annual emissions of the seven MSATs as estimated by the MOVES model for the No Build Alternative and the Build Alternative. The model results for annual MSAT emissions for each year show either no difference or only slight differences between the No Build Alternative and the Build Alternative. Therefore, there is no appreciable difference in overall MSAT emissions when comparing the Build Alternative to the No Build Alternative. In addition, emissions in future years for both alternatives (i.e., in 2025 and 2035) are predicted by MOVES to be lower than 2015 emissions as a result of the EPA's national mobile source control programs and anticipated changes in vehicle technology. The FHWA analyzed future national MSAT emission trends using MOVES for the period 2010 to 2050. The FHWA assumed an estimated VMT growth of 102% during this period and found that national MSAT annual emissions would be lowered by 83% (FHWA 2012). Table C-11shows the overall downward trend in MSAT emission within the Study Area over the analyzed time period.

Table C-11 Annual MSAT Emissions

Alternative	MSAT Pollutant Emissions						
	Acrolein (tons)	Benzene (tons)	1,3-Butadiene (tons)	Diesel PM (tons)	Formaldehyde (tons)	Naphthalene (grams)	POM (tons)
2015							
No Build	0.26	4.97	0.67	24.9	3.88	0.00	0.08
Build	0.24	4.76	0.64	23.3	3.67	0.00	0.07
Build minus No Build	-0.02	-0.21	-0.03	-1.6	-0.21	0.00	-0.01
2025							
No Build	0.12	1.47	0.24	17.9	1.83	0.00	0.06
Build	0.12	1.44	0.24	17.8	1.76	0.00	0.06
Build minus No Build	0.00	-0.03	0.00	-0.1	-0.07	0.00	0.00
2035							
No Build	0.06	0.27	0.05	15.7	0.99	0.00	0.05
Build	0.04	0.19	0.03	11.1	0.69	0.00	0.05
Build minus No Build	-0.02	-0.08	-0.02	-4.6	-0.30	0.00	0.00

Specific design characteristics of the Build Alternative (i.e., elimination of Baird Drive, construction of Ramp D from the Plaza to I-190 northbound, and construction of Ramp PN from Porter Avenue to I-190 Plaza entrance ramp) result in a decrease in VMTs on local arterial streets near residences located along Busti Avenue. Localized changes in MSAT emissions are likely the result of these VMT changes and would lead to localized reductions in ambient concentrations of MSATs under the Build Alternative as compared to the No Build Alternative.

For the Build Alternative, the removal of Baird Drive and the re-routing of associated traffic exiting the Plaza by way of Baird Drive onto the new Ramp D would provide a greater distance between that portion of the Plaza-related traffic and residential areas. MSATs emitted from these vehicles would be located further from the residential areas compared to the No Build Alternative. The increase in separation distance would decrease the potential impact of MSAT emissions on residential areas since these areas would no longer be immediately adjacent to traffic exiting the Plaza.

3.5 Construction Particulate Matter

Emissions would occur during construction from operation of non-road construction vehicles and equipment and from dust generated during removal of Baird Drive and construction of Ramps PN and D. NYSDOT guidance prescribes methodologies for addressing construction-related emissions (NYSDOT 2001, revised 2012). Modeling of emissions from construction is not required because the construction related activities will cause temporary increases in emissions that would self-correct once the Project is completed.

4 Mitigation

Typical Environmental Performance Commitments (EPCs) in construction contracts to minimize potential localized air quality impacts during construction would be implemented including the following:

- Use ultra-low sulfur diesel fuel in off-road construction equipment with engine horsepower (HP) rating of 60 HP and above
- Limit unnecessary idling times on diesel powered engines to three minutes
- Locate diesel powered exhausts away from fresh air intakes
- Control dust related to the construction site through a Soil Erosion Sediment Control Plan that includes: a) spraying of a suppressing agent on dust pile (non-hazardous, biodegradable); b) containment of fugitive dust; or c) adjustment for meteorological conditions as appropriate.

Contract specification language would be developed during the final design-phase of the Project.

5 References

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A MOVES Model Files

Available by request on DVD.

The MOVES model files are provided on two DVDs. The combination of the number of MOVES model runs (96 runs) and the size of each output file results in a total data size of approximately 9 gigabytes (GB).

Contained on the DVDs are the MOVES RunSpec files (the file that controls the MOVES run), copies of data imported into MOVES for the Project-scale/site specific input requirements and the output files. The latter are viewable using the MySQL Browser program that is included in the MOVES installation Suite, available from the USEPA.

Copies of the MOVES files will be provided upon request.

B CAL3QHCR Model Files

On DVD.